Strengthening the Energy Sector Industrial Base

The United States is currently transitioning from a focus on energy scarcity to a paradigm of energy abundance, driven largely by the shale revolution and a transformational focus on supply chain resilience. However, decades of globalization, underinvestment in infrastructure, and the prioritization of short-term efficiency over long-term resilience have created structural risks. Recent global shocks, including the COVID-19 pandemic, geopolitical conflicts, and extreme weather events, have exposed vulnerabilities in critical supply chains, particularly within the energy, transportation, and healthcare sectors.

To address these challenges, the U.S. government has implemented a whole-of-government strategy to rebuild domestic manufacturing, diversify global supply sources, and institutionalize supply chain analytics. This report outlines the progress made over the last four years, the remaining vulnerabilities in the energy and minerals industrial bases, and the strategic priorities required to safeguard national and economic security through 2028.

The Impact of Speculative Investment in Energy Markets

The role of speculation in energy markets remains a subject of significant debate. Historically, periods of extreme price volatility, such as the doubling of oil prices between 2007 and 2008, have raised questions about whether supply and demand fundamentals can fully justify such rapid shifts. Some analysts argue that index speculation—where institutional investors allocate massive capital to commodity index strategies—has become a primary driver of price discovery distortions and damaging volatility.

Research suggests that when index speculators pour large amounts of capital into commodity markets, prices rise regardless of physical supply conditions; conversely, when this money is withdrawn, prices decline sharply. This has led to calls for rigid speculative position limits across all markets, including over the counter swaps, to prevent excessive speculation from hollowing out the industrial base.

However, other perspectives maintain that high energy prices are fundamentally the result of tight global supply and growing demand from emerging economies like China and India. In this view, speculators provide the liquidity necessary for producers and consumers to hedge their risks, and arbitrary restrictions on these financial flows could reduce investment in new production, leading to higher prices in the future.

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The Energy Sector Industrial Base (ESIB) is undergoing a rapid transformation from a system focused on producing hydrocarbons to one manufacturing advanced energy technologies. Leadership in this sector is now a matter of national security, on par with the defense industrial base.

Key Developments and Trends

The Biden-Harris Administration has utilized the Bipartisan Infrastructure Law, the Inflation Reduction Act, and the CHIPS and Science Act to catalyze over 1 trillion dollars in private sector investment in clean energy and manufacturing. Since 2021, these investments have led to a resurgence in domestic manufacturing for advanced batteries, solar module assembly, and nuclear fuel capacity.

Despite this progress, significant challenges remain. The People’s Republic of China currently enjoys structural advantages in energy supply chains, controlling more than 80 percent of global raw material processing and manufacturing capacity in sectors like solar and batteries. This concentration creates a risk of monopolistic behavior and leaves U.S. supply chains vulnerable to geopolitical coercion.

Sectoral Deep Dives

1. Advanced Batteries: U.S. battery demand is expected to grow six-fold by 2035. While the U.S. has a strong pipeline of downstream cell manufacturing projects, it remains heavily reliant on foreign sources for upstream minerals like lithium, cobalt, and graphite.

2. Solar Energy: Since the passage of the Inflation Reduction Act, the U.S. has announced enough solar module assembly projects to satisfy 80 percent of domestic demand by 2026. However, the U.S. still relies on foreign competitors for nearly all upstream components, including polysilicon, ingots, and wafers.

3. Nuclear Energy: The U.S. currently lacks at-scale enrichment capacity for high-assay low-enriched uranium (HALEU), which is largely concentrated in Russia. New programs are now investing in domestic enrichment to secure the future of advanced nuclear reactors.

Critical Minerals as a Strategic Foundation

Critical minerals are the foundation of all modern economies, essential for everything from electric vehicles to defense systems. Over the last 60 years, U.S. production of these minerals has declined while global processing has become increasingly concentrated in fewer countries.

Advancing Domestic Capacity

Since 2021, the Department of the Interior has accelerated mapping of the nation’s subsurface, identifying previously unknown deposits of rare earth elements and cobalt. Additionally, the U.S. is investing in the circular economy by expanding its capacity to recover critical minerals from mine waste and recycled end-of-life products.

Global Diversification and Partnerships

Recognizing that the U.S. cannot onshore all segments of the mineral supply chain, the government is building international coalitions like the Minerals Security Partnership. These partnerships aim to secure global supply chains through high standards for labor and environmental protection, providing a transparent alternative to the practices of strategic competitors.

Managing Risks to Critical Infrastructure

Critical infrastructure, including the electric grid and pipeline networks, cannot be secure without resilient supply chains. The increasing digitization of these systems has introduced new cybersecurity risks, as sophisticated adversaries target vulnerabilities in software supply chains and industrial control systems.

Cybersecurity Challenges

The electric grid faces significant risks from cyberattacks that could result in widespread loss of service. Federal assessments have highlighted gaps in cyber-situational awareness and the security of supply chains for trusted partners. To mitigate these threats, the government is implementing new risk management cycles and tasking agencies with developing sector-specific resilience plans.

Infrastructure Resilience

Aging infrastructure remains a primary vulnerability. Significant portions of the U.S. natural gas transmission and gathering lines were built before 1970, necessitating urgent modernization and replacement. Furthermore, extreme weather events driven by climate change are increasingly damaging the systems that underpin society, requiring the fortification of ports, highways, and railways.

Priorities for Future Resilience

Over the next four years, the federal government will focus on four cross-cutting areas to ensure the enduring strength of American supply chains:

1. Delivering on Domestic Investment: The government must ensure that the hundreds of billions of dollars in announced manufacturing facilities are built quickly and remain competitive in the long term.

2. International Partnership and Friend-Shoring: The U.S. will continue to collaborate with allies to diversify sourcing, develop global standards, and minimize vulnerability to economic coercion.

3. Harnessing Innovation: Support for research and development will focus on identifying substitutes for critical raw materials and using technologies like artificial intelligence to improve supply chain visibility and forecasting.

4. Protecting the Level Playing Field: The U.S. will use trade tools, including targeted tariffs and export controls, to protect domestic investments from unfair competition and non-market policies of strategic competitors.

Conclusion

The path to building enduring resilience is a long-term commitment that requires sustained collaboration between the public and private sectors. While the United States has made historic progress in securing its industrial base and reducing its reliance on unstable markets, emerging challenges in cybersecurity, climate change, and geopolitical tensions will continue to test the system. By prioritizing transparency, innovation, and strategic investment, the United States can safeguard its energy independence and economic prosperity for years to come.